# Decision Makers Guide
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## 2.0 Introduction

In any critical review of Controlled Flight Into Terrain (CFIT) incidents or accidents, it becomes evident that there many interrelated factors that contribute to the causes of CFIT accidents. All of these factors are derived from some level of decision making. It is accepted that the flight crew is the last line of defense in preventing a CFIT accident, and that they make operational decisions that are critical to a safe flight. However, this section will address the responsibility and influence associated with higher level decision making.

For the purposes of this discussion, Decision Makers are those people and organizations who make or influence policy matters. They are:

- Political leaders.
- Aviation regulatory agencies, including air traffic control (ATC) authorities.
- International aviation organizations.
- Airline management.
- National safety advisory and investigation agencies.
- Pilot associations and unions.
- Aircraft manufacturers.
- Aircraft lessors.
- Aircraft insurers.
- Financial institutions.

Many contributing factors associated with CFIT accidents are embedded in policies and decisions made by these Decision Makers. ***Therefore, the goals of this CFIT Education and Training Aid can only be achieved with the endorsement and support of Decision Makers, not just the flight crews and other operators.*** In fact, many recommendations or strategies made in Section 3, Operators Guide, can only be successful if they are supported and implemented by the Decision Makers.

The underlying goal of all aviation industry Decision Makers should be system safety; the public expects it and assumes it. The reality is that humans make errors and always will, and, therefore, there will always be some level of risk associated with the aviation industry. The goal at the Decision Makers level must be management of this risk. Each level of authority has the capacity to implement the recommended CFIT avoidance strategies and achieve worthwhile results independently of other levels. When all levels do so in coordination with one another, the maximum effect can be achieved.

Reducing CFIT accidents requires recognition that such accidents are system induced; that is, that they are generated by shortcomings in the aviation system, including deficiencies in the organizations that constitute that system. In discussing the principle of joint causation and the influence of the organization, Arostegui and Maurino[1] state: "Such understanding will preclude the piecemeal approaches based on design, training, or regulations which have plagued past safety initiatives. Looking into the organizational context will permit one to evaluate whether organizational objectives and goals are consistent or conflicting with the design of the organization, and whether operational personnel have been provided with the necessary means to achieve such goals."

While we acknowledge the broadness in the spectrum of those organizations we include as Decision Makers, it is important not to overlook the great influence that airline management has on safety in general, and specifically on preventing CFIT accidents. ***Airline management creates the safety culture of the organization. This culture then affects everyone within the organization.*** In an article by the ICARUS Committee[2], safety is placed in perspective with other organization goals: "Accidents and incidents are preventable through effective management: doing so is cost effective.

[1] **Human Factors and Training Issues in CFIT Accidents and Incidents**, Captain Roberto Arostegui and Captain Daniel Maurino.

[2] **The Dollars and Sense of Risk Management And Airline Safety**, Flight Safety Foundation, Flight Safety Digest, December 1994.

An airline is formed to achieve practical objectives. Although frequently so stated, safety is not, in fact, the primary objective. The airline's objectives are related to production: transporting passengers or transporting goods and producing profits. Safety fits into the objectives, but in a supporting role: to achieve the production objectives without harm to human life or damage to property. Management must put safety into perspective, and must make rational decisions about where safety can help meet the objectives of the organization. From an organizational perspective, safety is a method of conserving all forms of resources, including controlling costs. Safety allows the organization to pursue its production objectives without harm to human life or damage to equipment. Safety helps management achieve objectives with the least risk."

This article also makes the point that, historically, safety initiatives have originated at the institutional levels closest to the accident, i.e., operators. This has improved performance, and it has resulted in enhanced aviation safety; however, the industry has reached the point of diminishing returns from this approach. A greater expenditure of resources at the operational end of the system will not result in proportionate safety benefits. Therefore, it is now necessary for prevention strategies to take into account the total aviation industry and infrastructure.

## 2.1 Recommendations to Decision Makers

Section 3, Operators Guide, contains many recommendations that, when implemented, can mitigate CFIT accident risk by addressing systemic and other factors that lead to this type of accident. Systemic problems may remain undetected for years before they surface as a contributing factor of a CFIT accident. What may initially appear to be an operational breakdown in reality may have been the result of omitting CFIT prevention training from the overall training program or perhaps having a marginal safety awareness program within the organization.

Decision Makers must be involved in order to implement these recommendations, as well as those applicable to nonoperators. In order to provide consistency and ease of identification, most of the recommendations are summarized in this Decision Makers section. ***A full report of the Training and Procedures Work Group and Aircraft Equipment Team is included in Section 5. Decision Makers should review these items and the other information included in these secs. 3 and 5 and incorporate the policies and recommendations into their organizations, if appropriate.***

### 2.1.1 Measurement and Evaluation of System Performance

Many operators currently have insufficient methods to provide systems and infrastructure for monitoring and evaluating the operational performance of management, flight crews, and equipment. All operators should provide these systems, with the objective of enhancing operational integrity. This can be accomplished by means of some, or preferably, all, of the following:

- Flight data recorder analysis.
- Quick access recorder analysis.
- Flight Operations Quality Assurance Programs.
- Databases for safety analysis.
- Defined criteria for safety reporting.
- Establishment and encouragement of a "no blame" reporting culture.
- Effective application by the management process/culture of accumulated data.
- Implementation of an independent quality audit function to achieve operational integrity.

### 2.1.2 Use of Autopilots

Flight crews do not take full advantage of automatic systems to manage the progress of a flight and reduce workload. The use of autopilots is encouraged during all approaches and missed approaches, in instrument meteorological conditions (IMC), when suitable equipment is installed. It is incumbent upon operators to develop specific procedures for the use of autopilots and autothrottles during precision approaches, nonprecision approaches, and missed approaches and to provide simulator-based training in the use of these procedures to all flight crews. Autopilot and autothrottle functionality and limitations also need to be thoroughly understood by flight crews.

### 2.1.3 Acceptance of ATC Clearances

From time to time, ATC issues flawed instructions that do not ensure adequate terrain clearance. Such clearances are too often accepted by flight crews without considering consequences and/or questioning instructions. Flight crews should not as-

sume that ATC clearances will ensure terrain clearance. If an ATC clearance is given that conflicts with the flight crew assessment of terrain criteria relative to known position, the clearance should be questioned and, if necessary, refused, and suitable action should be taken. Training programs should address this issue.

### 2.1.4 Chart Supply

The failure of operators to provide flight crews with adequate supplies of current navigation and approach charts is a significant barrier to safety. In some instances, current charting standards do not provide adequate information to flight crews about potential terrain hazards, or they are so complex as to make clear interpretation difficult. Each flight crew should be provided with accurate, current charts with clear depiction of hazardous terrain and minimum safe altitudes. Such charts should depict hazardous terrain or minimum safe altitudes, preferably in color, in a manner that is easy to recognize, understand, and read under cockpit lighting at night. Electronic displays should resemble printed charts to the maximum extent feasible.

### 2.1.5 Use of Checklists

Poorly conceived procedures for use of checklists can result in task saturation of flight crews during critical phases of flight. Incidents and accidents have occurred as a result of noncompletion of relevant checklist(s). It is recommended that a detailed policy on the use of checklists be formulated by each operator and that a strict discipline regarding their use be maintained. Such policies should require that checklists be completed early in the approach phase to minimize distraction while maneuvering close to the ground. In the absence of other guidance, checklists should be completed no later than 1,000 ft AGL.

### 2.1.6 Allocation of Flight Crew Duties, Use of Monitored Approach Procedures

The majority of CFIT incidents/accidents are known to occur in IMC and at night, when the pilot flying the approach also lands the aircraft. Proper management of flight crew workload at night and during IMC requires that precise and unambiguous procedures be established. It is recommended that operators consider adopting a monitored approach procedure during approaches and missed approaches conducted in these conditions. In this case, the First Officer will fly approaches and missed approaches. The Captain will monitor approach progress and subsequently land the aircraft after obtaining sufficient visual reference.

### 2.1.7 Rate of Descent Policy

High rates of descent in close proximity to terrain are dangerous. They result in increased risk of CFIT, high flight crew workload, and reduced margins of safety. A policy should be established that restricts the rate of descent allowed within a prescribed vertical distance of (1) the applicable Minimum Enroute Altitude (MEA) and (2) the Minimum Sector Altitude, as defined by ICAO Procedures for Air Navigation Services—Aircraft Operations/Terminal Instrument Procedures (PANS-OPS/TERPS). As an example, the restriction could be 2,000 ft/min maximum rate of descent at or below 2,000 ft above either of these altitudes.

### 2.1.8 Route and Destination Familiarization

Flight crews may be inadequately prepared for CFIT critical conditions, both enroute and at destination. Flight crews should be provided with adequate means to become familiar with enroute and destination conditions for routes deemed CFIT critical. One or more of the following methods are considered acceptable for this purpose:

- When making first flights along routes or to destinations deemed CFIT critical, Captains should be accompanied by another pilot familiar with the conditions.
- Suitable simulators can be used to familiarize flight crews with airport critical conditions when those simulators can realistically depict the procedural requirements expected of flight crew members.
- Written guidance, dispatch briefing material, and video familiarization using actual or simulated representations of destination and alternatives should be provided.

### 2.1.9 Stabilized Approaches

Unstable approaches contribute to many incidents/accidents. Pilots should establish a stabilized approach profile for all instrument and visual approaches. A stabilized approach has the following characteristics:

- A constant rate of descent along an approximate 3-deg approach path that intersects the landing runway approximately 1,000 ft beyond the approach end and begins not later than the final approach fix or equivalent position.
- Flight from an established height above touchdown should be in a landing configuration with appropriate and stable airspeed, power setting, trim, and constant rate of descent and on the defined descent profile.
- Normally, a stabilized approach configuration should be achieved no later than 1,000 ft AGL in IMC. However, in all cases if a stabilized approach is not achieved by 500 ft AGL, an immediate missed approach shall be initiated.

### 2.1.10 Crew Resource Management

Decision Makers should support effective Crew Resource Management (CRM) and ensure that it is the normal way that flight crews operate within their organization. This is essential for safe, orderly, and profitable operation of an airline's flights.

### 2.1.11 Standard Operating Procedures

Many studies show that airlines with established, well thought out and implemented standard operating procedures (SOP) have consistently safer operations. Clear, concise, and understandable SOPs need to be developed by each airline. Through these procedures and behaviors, the airline sets the standards that the flight crews are required to follow. Flight crews, on the other hand, must be able to inform management when these procedures are not producing the desired results.

All levels of decision making throughout the airlines must ensure that appropriate SOPs are in place and flight crews are trained to use them. These SOPs must address not only the needs of the airline, but the responsibilities of both management and operations. If these policies are not understood by either party, changes must be proposed, agreed to by all concerned, and implemented. Remember, this is an ongoing process. As situations change, the policies must be reevaluated for comparable change. Flight crews need to know what is required of them.

## 2.2 Communication

The link between Decision Makers and operations is communication and training. This should be two-way communication. Decision Makers are responsible for the broad scope of the operation, and they set the tone for the everyday routine. They must listen to those people who accomplish the day-to-day tasks, take appropriate action based on data obtained from operational performance monitoring systems, and be able to adjust the overall scope to meet the operational challenges.

All who are involved in the aviation industry must work as a team to prevent CFIT. This includes the flight crew and cabin staff, the mechanic, the airline CEO, the cockpit designer, ATC, the airplane manufacturers, and perhaps a nation's elected or appointed official or a sales representative. To fix systemic problems, it takes a broad approach that includes many people. All of these people have a vested interest in the success of aviation, all are rightfully proud of their contribution to the common goal, and all are inexorably tied to one another. We are all in this together. We share the successes. We must also shoulder the responsibility for the shortcomings. We must work to mold everyone into a highly professional and dedicated team.

Managing flight crew resources means the dissemination of information—integrating and using the entire flight crew aboard an airplane to bring about a safe and smoothly running flight. This CFIT team concept is just as applicable to the broad spectrum of the aviation industry as it is to the flight crew of a single airplane. With everyone's commitment, this industry can make airplane travel even safer than it is now.

## 2.3 Short-Term Goals

To help stop CFIT from continuing to claim lives, the entire aviation industry should work together to institute some immediate measures.

### 2.3.1 ATC Issues

At the highest levels, there should be a commitment to installation of modern communication facilities throughout the world. Upgraded radio communication, radar, civilian air traffic control of the airways, addition of precision instrument approaches and addition of VASI or PAPI lights to runways, and standardization of approach design criteria and procedures should also be implemented. Language training for both flight crews and air traffic controllers should be improved and intensified to enhance ATC's ability to absorb the increasing number of airplanes. If this is not possible, then remedial measures should be considered.

### 2.3.2 Sharing Information

Airline management, ATC, and regulatory agencies can do their part by being more open with information. Any mistrust between these parties needs to be addressed. Change occurs even faster today than just 5 years ago, and the rate is increasing. All parties involved need to be more open to the new technologies and thinking. Safety in aviation comes about, in part, by freely sharing information. This means allowing flight crews to learn from others' experiences. Currently, the exchange of this information is too highly restricted, partly because some management policies tend to blame first and think about safety next and partly because people don't like to admit to certain shortcomings.

If we learn from the mistakes of others, then it seems logical to institute, within all air carriers, an incident reporting system that will deliver information, but without stigma. One of the largest international carriers in the world has used this system for years and has nothing but praise for the results. This airline can confidentially track trends with the use of flight data recordings and subsequent analysis. The dissemination of this information along with flight crew reports of incidents and potential incidents can prevent accidents. Lives are being saved at little or no cost to the carrier. This is not just a task for the airline managers. Flight crews need to support this initiative and be given assurance that inappropriate punitive action will not be taken as a result. The various industry associations also need to embrace the idea that shared information will improve safety.

### 2.3.3 Standard Operating Procedures

There are some airlines that do not currently have good SOPs. This can be resolved in a very short time. While some airlines consider SOPs proprietary, it should be possible to share most of the basic information with those airlines that need to establish SOPs.

### 2.3.4 Ground Proximity Warning System Installation and Modification Updates

The installation of the Ground Proximity Warning System (GPWS) on all airplanes in a carrier's fleet can reduce CFIT accidents. It is one of the major weapons in the growing arsenal of CFIT prevention methods. Every airplane in every fleet in the world should be equipped with a fully functioning GPWS. Airplanes currently using the original Mark I GPWS should be retrofitted with the newer, updated GPWS equipment to take advantage of technology improvements. Incorporate automatic radio altitude voice callouts to improve terrain awareness. This will give our flight crews and passengers the best chance for survival.

### 2.3.5 CFIT Accident Prevention Training Program

Airlines that are considered the safest in the industry all have a complete training program that includes CFIT prevention. Most are already teaching their flight crews about the factors and causes of CFIT accidents as well as techniques to avoid getting into these situations in the first place. These airlines make sure that all of their flight crews understand the need for thorough briefings, professional flying, and CRM.

This training aid includes a full training program with both academic and simulator training. An instructor briefing supplement, CFIT safety briefing, and questions are also part of the Example CFIT Training Program section in this training aid. Airlines that currently have a CFIT education and prevention training program in place should review the contents of the Example CFIT Training Program and choose those areas that they deem appropriate for supplementing their current training. Those airlines that do not include CFIT prevention in their training program are encour-

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aged to use the entire Example CFIT Training Program to ensure that their flight crews understand the threat posed by CFIT.

### 2.3.6 Approach Procedure Design and Specifications

The improved design of the nonprecision approach can be accomplished at little cost. This objective can be met by the simplification of the nonprecision approach, the specification of a stabilized approach, and the provision of a nominal 3-deg glide path.

Specifications for approach criteria are contained in ICAO PANS-OPS and U.S. TERPS. There are many instrument approaches being used by airlines that do not comply with either of these specifications. Organizations, states, regulatory agencies, and others who are responsible for designing instrument approaches should adopt these standardized specifications.

Additionally, significant terrain around airports should be depicted on color contour approach chart products. Flight crew situational awareness would be greatly enhanced.

### 2.3.7 Barometric Altimetry

The loss of vertical situational awareness is the cause of many CFIT accidents. The contributing factors associated with this cause often have to do with the barometric altimeter. These factors range from misinterpretation of the three-pointer and drum-pointer altimeter to confusion resulting from the use of different altitude and height reference systems, as well as altimeter setting units of measurement. Flight crew training is now used as a means of solving this problem, but consideration should be given to discontinuing the use of some altimeter designs and standardizing the use of altitude and height reference systems and altimeter setting units of measurement.

## 2.4 Long-Term Solutions

The CFIT Training and Procedures Working Group believes that a long-term solution to CFIT is in communication and training. The management structure must permit a free flow of information in all directions. This would allow the timely passing of information about safety issues that will help prevent CFIT accidents and incidents. Equally important is a comprehensive CFIT prevention training program. All carriers should implement and maintain intensive initial and recurrent ground and simulator training that covers CFIT prevention strategies.

Decision Makers control many of the systemic solutions for preventing CFIT accidents. A detailed analysis that includes the subjects covered in this section should be made, and appropriate action should be taken.